CLAIMS

1. A self-attaching fastener, comprising:

a central pilot portion;

an annular flange portion surrounding said pilot portion having a planar end face; and

an annular groove in said end face of said flange portion surrounding said pilot portion including a bottom wall, an inner side wall surrounding said pilot portion and an opposed outer side wall, one of said inner and outer side walls of said annular groove inclined toward the other of said inner and outer side walls to define a restricted opening of said annular groove adjacent said end face of said flange portion;

said bottom wall of said annular groove including a plurality of circumferentially spaced radial anti-rotation elements each having a radial top face spaced above a plane of said bottom wall of said annular groove and a second plurality of circumferentially spaced radial anti-rotation elements each having a top face spaced below said plane of said bottom wall of said annular groove.

2. The self-attaching fastener as defined in Claim 1, wherein said first and second plurality of circumferentially spaced anti-rotation elements circumferentially alternate.

3. The self-attaching fastener as defined in Claim 1, wherein said top faces of said first and second plurality of circumferentially spaced radial anti-rotation elements are inclined relative to said bottom wall of said annular groove.

4. The self-attaching fastener as defined in Claim 3, wherein said top face of each of said second plurality of circumferentially spaced radial anti-rotation elements is inclined downwardly from a midportion of said bottom wall of said annular groove to adjacent said one of said inner and outer side walls of said annular groove having an end surface spaced below said plane of said bottom wall of said annular groove adjacent said one of said inner and outer side walls.

5. The self-attaching fastener as defined in Claim 3, wherein said first plurality of circumferentially spaced radial anti-rotation elements is inclined upwardly from a midportion of said bottom wall of said annular groove to one of said inner and outer side walls of said annular groove each having an end surface spaced above said plane of said bottom wall of said annular groove.

6. The self-attaching fastener as defined in Claim 3, wherein said bottom wall of said annular groove is planar and extends generally parallel to said planar end face of said annular flange portion.

7. The self-attaching fastener as defined in Claim 3, wherein said top face of each of said first and second plurality of circumferentially spaced radial anti-rotational elements is inclined relative to said bottom wall of said annular groove at an angle of between five and fifteen degrees.

8. The self-attaching fastener as defined in Claim 1, wherein said outer wall of said annular groove is inclined inwardly from said bottom wall toward said pilot portion, said top face of each of said first plurality of circumferentially spaced anti-rotation elements is inclined upwardly from said bottom wall to said outer wall having an end surface adjacent said outer side wall spaced above a plane of said bottom wall and said top face of each of said second plurality of circumferentially spaced radial anti-rotation elements is inclined downwardly toward said inner wall of said annular groove each having an end surface adjacent said inner wall spaced below said plane of said bottom wall of said annular groove.

9. The self-attaching fastener as defined in Claim 8, wherein said top face of each of said first and second plurality of circumferentially spaced radial anti-rotation elements is inclined from a midportion of said bottom wall toward one of said inner and outer side walls of said annular groove.

10. The self-attaching fastener as defined in Claim 8, wherein said top face of each of said first and second plurality of circumferentially radial anti-rotation elements is inclined relative to said bottom wall of said annular groove at an angle of between five and fifteen degrees.

11. A self-attaching fastener, comprising:

a central pilot portion;

an annular flange portion surrounding said pilot portion having a planar end face; and

an annular groove in said end face of said flange portion surrounding said pilot portion including a planar bottom wall, an inner side wall surrounding said pilot portion and an opposed outer side wall, one of said inner and outer side walls of said annular groove inclined toward the other of said inner and outer side walls to define a restricted opening of said annular groove adjacent said end face of said flange portion;

said planar bottom wall of said annular groove having a plurality of circumferentially spaced radial anti-rotation elements including a first plurality of circumferentially spaced radial anti-rotation elements each having a planar top face inclined radially upwardly from said bottom wall of said annular groove toward said one of said inner and outer side walls of said annular groove having an end surface spaced above said planar bottom wall and a second plurality of circumferentially spaced radial anti-rotation elements each having a planar top face inclined downwardly from said bottom wall toward the other of said one of said inner and outer side walls of said annular groove each having an end surface spaced below said bottom wall of said annular groove.

12. The self-attaching fastener as defined in Claim 11, wherein said first and second plurality of circumferentially radial anti-rotation elements circumferentially alternate, such that one of said first plurality of circumferentially spaced radial anti-rotation elements is located between two of said plurality of circumferentially spaced radial anti-rotation elements.

13. The self-attaching fastener as defined in Claim 11, wherein said first and second plurality of circumferentially spaced radial anti-rotation elements are inclined from a midportion of said bottom wall of said annular groove toward one of said inner and outer side walls of said annular groove.

14. The self-attaching fastener as defined in Claim 13, wherein said inner wall of said annular groove is inclined from said bottom wall toward said outer wall and said outer wall of said annular groove is inclined toward said inner wall, said first plurality of circumferentially spaced radial anti-rotation elements being inclined upwardly from a midportion of said bottom wall to said outer wall of said annular groove and said second plurality of circumferentially spaced radial anti-rotation elements is inclined downwardly from a midportion of said bottom wall toward said inner side wall of said annular groove.

15. The self-attaching fastener as defined in Claim 13, wherein said second plurality of circumferentially spaced radial anti-rotation elements has a radial length greater than a radial length of said first plurality of circumferentially spaced radial anti-rotation elements.

16. The self-attaching fastener as defined in Claim 11, wherein said top face of each of said first and second plurality of circumferentially spaced radial anti-rotation elements is inclined relative to said planar bottom wall at an angle of between five and fifteen degrees.

17. A female self-attaching fastener, comprising:

a central pilot portion having an end face and a bore through said end face extending through said pilot portion;

an annular flange portion surrounding said pilot portion having a planar end face; and

an annular groove in said end face of said flange portion surrounding said pilot portion including a planar bottom wall, an inner side wall surrounding said pilot portion and an opposed outer side wall, one of said inner and outer side walls inclined toward the other of said inner and outer side walls to define a restricted opening of said annular groove at said end face of said flange portion;

said bottom wall of said annular groove including a plurality of circumferentially spaced radial anti-rotation elements, including a first plurality of circumferentially spaced anti-rotation elements each having a radial top face inclined upwardly from said bottom wall of said annular groove to said outer wall having a radial end surface at said outer wall spaced above said bottom wall of said annular groove, and a second plurality of circumferentially spaced anti-rotation elements each having a radial top face inclined downwardly from said bottom wall of said annular groove toward said inner side wall of said annular groove having a radial end surface spaced below said bottom wall of said annular groove.

18. The female self-attaching fastener as defined in Claim 17, wherein said first and second plurality of circumferentially spaced anti-rotation elements circumferentially alternate, such that one of said first plurality of circumferentially spaced anti-rotation elements is located between two of said second plurality of circumferentially spaced anti-rotation elements.

19. The female self-attaching fastener as defined in Claim 17, wherein said top face of each of said first and second plurality of circumferentially spaced anti-rotation elements is inclined from a midportion of said bottom wall.

20. The female self-attaching fastener as defined in Claim 19, wherein said top face of each of said second plurality of circumferentially spaced anti-rotation elements is longer than said top face of said first plurality of circumferentially spaced anti-rotation elements.

21. The female self-attaching fastener as defined in Claim 17, wherein said top face of said first and second plurality of circumferentially spaced anti-rotation elements is inclined from said bottom wall of said annular groove at an angle of between five and fifteen degrees.

22. A method of attaching a female fastener to a metal panel, said female fastener including a central pilot portion having a bore therethrough, an annular flange portion surrounding said pilot portion having an end face and an annular groove in said end face of said flange portion including a bottom wall, an inner side wall surrounding said pilot portion and an opposed outer side wall, wherein said bottom wall of said annular groove includes a plurality of circumferentially spaced anti-rotation elements including a first plurality of circumferentially anti-rotation elements each having a radial top face inclined upwardly from said bottom wall to said outer side wall of said annular groove and a second plurality of circumferentially spaced anti-rotation elements each having a top face inclined downwardly from said bottom wall to said inner side wall of said annular groove, said method comprising the following steps:

driving said pilot portion of said female fastener through an opening in a metal panel;

driving said panel surrounding said opening against said bottom wall of said annular groove and against said top faces of said plurality of circumferentially spaced anti-rotation elements; and

deforming said panel around said first plurality of circumferentially spaced anti-rotation elements and against said bottom wall and against said top face of said second plurality of circumferentially spaced anti-rotation elements, driving said panel against said inner side wall of said annular groove.

23. The method of attaching a female fastener to a metal panel as defined in Claim 22, wherein said inner side wall of said annular groove is inclined outwardly from said bottom wall toward said outer side wall and said method includes driving said panel against said top face of said second plurality of spaced anti-rotation elements beneath said outer side wall of said annular groove.